



IMAMURA 2005_0822A Revised Sequence Listing filed 2006-03-02
SEQUENCE LISTING

<110> IMAMURA, Hiromi
YOSHIDA, Masasuke
YOKOYAMA, Ken

<120> A Rotary Motor molecule V1-ATPase

<130> 2005_0822A/WMC/00653

<140> US 10/535,667
<141> 2005-05-19

<150> JP2002-337212
<151> 2002-11-20

<150> PCT/JP2003/012983
<151> 2003-10-09

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<170> PatentIn Ver. 2.1

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Leu Ala Gly Leu Glu Gly Tyr Gly Ala Ser Ser Ala Glu Glu Ala Gln
20 25 30

agc ctc ctg gaa acc ctc gtg gag cgg ggc ggc tac gcc ctg gtg gcc 144
Ser Leu Leu Glu Thr Leu Val Glu Arg Gly Tyr Ala Leu Val Ala
35 40 45

gtg gac gag gcg ctc ctc ccc gac ccc gag cgg gcg gtg gag cgc ctc 192
Val Asp Glu Ala Leu Leu Pro Asp Pro Glu Arg Ala Val Glu Arg Leu
50 55 60

atg cgg ggc agg gac ctc ccc gtg ctc ctg ccc atc gcg ggg ctg aag 240
Met Arg Gly Arg Asp Leu Pro Val Leu Leu Pro Ile Ala Gly Leu Lys

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65	70	75	80	
gag gcc ttc cag ggg cac gac gtg gaa ggc tac atg cgg gag ctg gtg				288
Glu Ala Phe Gln Gly His Asp Val Glu Gly Tyr Met Arg Glu Leu Val				
85	90	95		
agg aag acc atc ggc ttt gac atc aag ctg tagaatggag ggacg atg atc				339
Arg Lys Thr Ile Gly Phe Asp Ile Lys Leu				
100	105			
caa ggg gtg atc cag aag atc gcg ggc ccg gcg gtg atc gcc aag ggc				387
Gln Gly Val Ile Gln Lys Ile Ala Gly Pro Ala Val Ile Ala Lys Gly				
110	115	120		
atg ctc ggg gcc cgc atg tac gac atc tgc aag gtg ggc gaa gag ggc				435
Met Leu Gly Ala Arg Met Tyr Asp Ile Cys Lys Val Gly Glu Glu Gly				
125	130	135	140	
ctc gtg ggc gag atc atc cgc ctg gac ggg gac acg gcc ttc gtc cag				483
Leu Val Gly Glu Ile Ile Arg Leu Asp Gly Asp Thr Ala Phe Val Gln				
145	150	155		
gtc tac gag gac acc tcg ggc cta aag gtg ggg gag ccc gtg gtc tcc				531
Val Tyr Glu Asp Thr Ser Gly Leu Lys Val Gly Glu Pro Val Val Ser				
160	165	170		
acg ggg ctt ccc ttg gcg gtg gag ctc ggc ccc ggg atg ctg aac ggc				579
Thr Gly Leu Pro Leu Ala Val Glu Leu Gly Pro Gly Met Leu Asn Gly				
175	180	185		
atc tac gac ggc atc cag cgc ccc ctg gag cgc atc cgg gag aag acg				627
Ile Tyr Asp Gly Ile Gln Arg Pro Leu Glu Arg Ile Arg Glu Lys Thr				
190	195	200		
ggg atc tac atc acc cgg ggc gtg gtg gtc cac gcc ctg gac cgg gag				675
Gly Ile Tyr Ile Thr Arg Gly Val Val Val His Ala Leu Asp Arg Glu				
205	210	215	220	
aag aag tgg gcc tgg acg ccc atg gtc aag ccc ggg gac gag gtg cgg				723
Lys Lys Trp Ala Trp Thr Pro Met Val Lys Pro Gly Asp Glu Val Arg				
225	230	235		
ggg ggt atg gtc ctg ggc acg gtg ccc gag ttc ggc ttc acc cac aag				771
Gly Gly Met Val Leu Gly Thr Val Pro Glu Phe Gly Phe Thr His Lys				
240	245	250		
atc ctg gta ccc ccg gac gtg cgg ggc cgg gtc aag gag gtg aag ccc				819
Ile Leu Val Pro Pro Asp Val Arg Gly Arg Val Lys Glu Val Lys Pro				
255	260	265		
gcc ggg gag tac acc gtg gag gag ccg gtg gtg gtc ctc gag gac ggc				867
Ala Gly Glu Tyr Thr Val Glu Glu Pro Val Val Val Leu Glu Asp Gly				
270	275	280		
acc gag ctc aag atg tac cac acc tgg ccc gtt cgc cgg gcg agg ccc				915
Thr Glu Leu Lys Met Tyr His Thr Trp Pro Val Arg Arg Ala Arg Pro				
285	290	295	300	
gtg caa agg aag ctt gac ccc aac acc ccc ttc ctc acg ggg atg cgc				963
Val Gln Arg Lys Leu Asp Pro Asn Thr Pro Phe Leu Thr Gly Met Arg				
305	310	315		
atc ctg gac gtc ctc ttc ccc gtg gcc atg ggg ggc acc gcc gcc atc				1011

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Ile	Leu	Asp	Val	Leu	Phe	Pro	Val	Ala	Met	Gly	Gly	Thr	Ala	Ala	Ile	
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cct	ggg	ccc	tcc	ggc	agc	ggc	aag	acc	gtg	acc	cag	cag	tcc	ctg	gcc	1059
Pro	Gly	Pro	Phe	Gly	Ser	Gly	Lys	Thr	Val	Thr	Gln	Gln	Ser	Leu	Ala	
	335				340						345					
aag	tgg	tcc	aac	gcc	gac	gtg	gtg	gtc	tac	gtg	ggc	tgc	ggg	gag	cgg	1107
Lys	Trp	Ser	Asn	Ala	Asp	Val	Val	Val	Tyr	Val	Gly	Cys	Gly	Glu	Arg	
	350				355						360					
ggg	aac	gag	atg	acc	gac	gtg	ctc	gtg	gag	ttc	ccc	gag	ctc	acc	gac	1155
Gly	Asn	Glu	Met	Thr	Asp	Val	Leu	Val	Glu	Phe	Pro	Glu	Leu	Thr	Asp	
	365				370					375						
ccc	aag	acg	ggg	ggg	ccc	ttg	atg	cac	cgc	acc	gtc	ctc	atc	gcc	aac	1203
Pro	Lys	Thr	Gly	Gly	Pro	Leu	Met	His	Arg	Thr	Val	Leu	Ile	Ala	Asn	
	385					390							395			
acc	tcc	aac	atg	ccc	gtg	gcc	gcc	cgc	gag	gcc	agc	atc	tac	gtg	ggc	1251
Thr	Ser	Asn	Met	Pro	Val	Ala	Ala	Arg	Glu	Ala	Ser	Ile	Tyr	Val	Gly	
	400					405							410			
gtg	acc	atc	gcc	gag	tac	tcc	cgc	gac	cag	ggc	tcc	gtg	gcc	ctc		1299
Val	Thr	Ile	Ala	Glu	Tyr	Phe	Arg	Asp	Gln	Gly	Phe	Ser	Val	Ala	Leu	
	415				420						425					
atg	gcc	gac	tcc	acg	agc	cgc	tgg	gcc	gag	gct	ttg	cgc	gag	atc	tct	1347
Met	Ala	Asp	Ser	Thr	Ser	Arg	Trp	Ala	Glu	Ala	Leu	Arg	Glu	Ile	Ser	
	430				435						440					
agc	cgc	ctc	gag	gag	atg	ccc	gcc	gag	gag	ggc	tac	ccg	ccc	tac	ctc	1395
Ser	Arg	Leu	Glu	Glu	Met	Pro	Ala	Glu	Glu	Gly	Tyr	Pro	Pro	Tyr	Leu	
	445				450					455					460	
gcc	gcc	agg	ctc	gcc	gcc	tcc	tac	gag	cg	g	gc	aag	gtc	atc	acc	1443
Ala	Ala	Arg	Leu	Ala	Ala	Phe	Tyr	Glu	Arg	Ala	Gly	Lys	Val	Ile	Thr	
	465					470					475					
ctg	ggc	ggc	gag	gag	ggg	g	gtg	acc	atc	gtg	ggg	gcc	gtc	tcc	ccg	1491
Leu	Gly	Gly	Glu	Glu	Gly	Ala	Val	Thr	Ile	Val	Gly	Ala	Val	Ser	Pro	
	480					485							490			
ccg	ggc	ggc	gac	atg	tcc	gag	ccc	gtg	acc	cag	tcc	acc	ttg	agg	atc	1539
Pro	Gly	Gly	Asp	Met	Ser	Glu	Pro	Val	Thr	Gln	Ser	Thr	Leu	Arg	Ile	
	495				500								505			
gtg	ggg	gcc	tcc	tgg	cgg	ctt	gac	gcc	tcc	ctg	gcc	tcc	cg	cg	cac	1587
Val	Gly	Ala	Phe	Trp	Arg	Leu	Asp	Ala	Ser	Leu	Ala	Phe	Arg	Arg	His	
	510				515						520					
tcc	ccc	gcc	atc	aac	tgg	aac	ggc	tcc	tac	agc	ctc	tcc	acc	tcc	gcc	1635
Phe	Pro	Ala	Ile	Asn	Trp	Asn	Gly	Ser	Tyr	Ser	Leu	Phe	Thr	Ser	Ala	
	525				530					535					540	
ctt	gac	ccc	tgg	tac	cg	gag	aac	gtg	gcc	gag	gac	tac	ccc	gag	ctc	1683
Leu	Asp	Pro	Trp	Tyr	Arg	Glu	Asn	Val	Ala	Glu	Asp	Tyr	Pro	Glu	Leu	
	545							550						555		
cg	gac	gcc	atc	tcc	gag	ctt	ttg	cag	cg	gag	g	gc	ggc	ctc	cag	1731
Arg	Asp	Ala	Ile	Ser	Glu	Leu	Leu	Gln	Arg	Glu	Ala	Gly	Leu	Gln	Glu	
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atc gtc cag ctc gtg ggg ccg gac gcc ctc cag gac gcc gag cgc ctc Ile Val Gln Leu Val Gly Pro Asp Ala Leu Gln Asp Ala Glu Arg Leu 575 580 585	1779
gtc att gag gtg ggc cggttccctg cag cag aac Val Ile Glu Val Gly Arg Ile Ile Arg Glu Asp Phe Leu Gln Gln Asn 590 595 600	1827
gcc tac cac gag gtg gac gcc tac tgc tcc atg aag aag gcc tac ggg Ala Tyr His Glu Val Asp Ala Tyr Cys Ser Met Lys Lys Ala Tyr Gly 605 610 615 620	1875
atc atg aag atg atc ctc gcc ttc tac aag gag gcg gag gcg gcc atc Ile Met Lys Met Ile Leu Ala Phe Tyr Lys Glu Ala Glu Ala Ala Ile 625 630 635	1923
aag cgg ggg gtt tcc ata gac gag atc ctg cag ctc ccc gtt ctg gag Lys Arg Gly Val Ser Ile Asp Glu Ile Leu Gln Leu Pro Val Leu Glu 640 645 650	1971
cgc atc ggc cgc gcc cgc tac gtg agc gag gag gag ttc ccc gcc tac Arg Ile Gly Arg Ala Arg Tyr Val Ser Glu Glu Glu Phe Pro Ala Tyr 655 660 665	2019
ttt gag gag gcc atg aag gag atc cag ggg gcc ttc aag gcc ctg gcc Phe Glu Glu Ala Met Lys Glu Ile Gln Gly Ala Phe Lys Ala Leu Ala 670 675 680	2067
taaaggggga gag atg gac ctt ctg aag aag gag tac acg ggc atc acc Met Asp Leu Leu Lys Lys Glu Tyr Thr Gly Ile Thr 685 690 695	2116
tac atc tcg ggg cct ctt ctc ttc gtg gag aac gcc aag gac ctg gcc Tyr Ile Ser Gly Pro Leu Leu Phe Val Glu Asn Ala Lys Asp Leu Ala 700 705 710	2164
tac ggg gcc atc gtg gac atc aag gac ggc acg ggc cgg gtc cgc ggc Tyr Gly Ala Ile Val Asp Ile Lys Asp Gly Thr Gly Arg Val Arg Gly 715 720 725	2212
ggc cag gtg att gag gtc tcc gag gag tac gcc gtc atc cag gtg ttt Gly Gln Val Ile Glu Val Ser Glu Glu Tyr Ala Val Ile Gln Val Phe 730 735 740	2260
gag gaa acc act ggg ctg gac ctg gcc acg acc agc gtg agc ctg gtg Glu Glu Thr Thr Gly Leu Asp Leu Ala Thr Thr Ser Val Ser Leu Val 745 750 755 760	2308
gag gac gtg gcc cggttccctg aag gag atg ctg ggc cgc cgc Glu Asp Val Ala Arg Leu Gly Val Ser Lys Glu Met Leu Gly Arg Arg 765 770 775	2356
ttc aac ggc atc ggc aag ccc ata gac ggc ctg ccgc ccc atc acc ccg Phe Asn Gly Ile Gly Lys Pro Ile Asp Gly Leu Pro Pro Ile Thr Pro 780 785 790	2404
gag aag cgg ctc ccc atc acc ggc ctt ccc tta aac ccc gtg gcc cgg Glu Lys Arg Leu Pro Ile Thr Gly Leu Pro Leu Asn Pro Val Ala Arg 795 800 805	2452
agg aag ccg gag cag ttc atc cag acg ggc atc tcc acc att gac gtg Arg Lys Pro Glu Gln Phe Ile Gln Thr Gly Ile Ser Thr Ile Asp Val 810 815 820	2500

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atg aac acc ctg gtc cg ^g ggg cag aag ctt ccc atc ttc tcc ggc tcg Met Asn Thr Leu Val Arg Gly Gln Lys Leu Pro Ile Phe Ser Gly Ser 825 830 835 840	2548
ggg ctt ccc gcc aac gag atc gcc g ^{cc} cag atc gcc cgc cag gcc acg Gly Leu Pro Ala Asn Glu Ile Ala Ala Gln Ile Ala Arg Gln Ala Thr 845 850 855	2596
gtg cgc ccc gac ctc tcc ggg gag g ^{gg} gag aag gag gag ccc ttc gcc Val Arg Pro Asp Leu Ser Gly Glu Gly Lys Glu Pro Phe Ala 860 865 870	2644
gtg gtc ttc gcc g ^{cc} atg ggg atc acg cag cgg gag ctc tcc tac ttc Val Val Phe Ala Ala Met Gly Ile Thr Gln Arg Glu Leu Ser Tyr Phe 875 880 885	2692
atc cag gag ttt gag cgc acc ggg gcc ctg agc cgc tcc gtc ctc ttc Ile Gln Glu Phe Glu Arg Thr Gly Ala Leu Ser Arg Ser Val Leu Phe 890 895 900	2740
ctg aac aag gcg gac ccc acc att gag cgc atc ctc acc ccc cgc Leu Asn Lys Ala Asp Asp Pro Thr Ile Glu Arg Ile Leu Thr Pro Arg 905 910 915 920	2788
atg gcc ctc acc gtg gcc gag tac ctg gcc ttt gag cac gac tac cac Met Ala Leu Thr Val Ala Glu Tyr Leu Ala Phe Glu His Asp Tyr His 925 930 935	2836
gtc ctc gtc atc ctc acg gac atg acc aac tac tgc gag gcc ttg cgg Val Leu Val Ile Leu Thr Asp Met Thr Asn Tyr Cys Glu Ala Leu Arg 940 945 950	2884
gag atc ggg gcc g ^{cc} cgc gag g ^{gg} atc ccg ggc cgc cgc ggt tac ccc Glu Ile Gly Ala Ala Arg Glu Glu Ile Pro Gly Arg Arg Gly Tyr Pro 955 960 965	2932
ggc tac atg tac acc gac ctg gcc acc atc tac gag cgc gcc ggg g ^{tg} Gly Tyr Met Tyr Thr Asp Leu Ala Thr Ile Tyr Glu Arg Ala Gly Val 970 975 980	2980
gtg gag ggg aag aag ggg agc gtg acc cag atc ccc atc ctc tcc atg Val Glu Gly Lys Lys Gly Ser Val Thr Gln Ile Pro Ile Leu Ser Met 985 990 995 1000	3028
ccc gac gac gac cgc acc cac ccc atc ccc gac ctc acg ggc tac atc Pro Asp Asp Asp Arg Thr His Pro Ile Pro Asp Leu Thr Gly Tyr Ile 1005 1010 1015	3076
acc gag ggg cag atc cag ctc tcc cgg gag ctc cac cgc aag ggc atc Thr Glu Gly Gln Ile Gln Leu Ser Arg Glu Leu His Arg Lys Gly Ile 1020 1025 1030	3124
tac ccg ccc att gac ccc ttg ccc tcc ctc tcc cgg ctc atg aac aac Tyr Pro Pro Ile Asp Pro Leu Pro Ser Leu Ser Arg Leu Met Asn Asn 1035 1040 1045	3172
ggc gtg ggc aag ggc aag acc cgg gag gac cac aag cag gtc tcc gac Gly Val Gly Lys Gly Lys Thr Arg Glu Asp His Lys Gln Val Ser Asp 1050 1055 1060	3220
cag ctc tac tcc gcc tac gcc aac ggg gtg gac atc cgg aag ctc gtg Gln Leu Tyr Ser Ala Tyr Ala Asn Gly Val Asp Ile Arg Lys Leu Val	3268

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1065	1070	1075	1080	
gcc atc atc ggc gag gac gcc ctc acg gag aac gac cgc cgt tac ctc Ala Ile Ile Gly Glu Asp Ala Leu Thr Glu Asn Asp Arg Arg Tyr Leu 1085	1090	1095		3316
cag ttc gcc gac gcc ttt gaa cggttc ttc atc aac cag ggg cag cag Gln Phe Ala Asp Ala Phe Glu Arg Phe Ile Asn Gln Gly Gln Gln 1100	1105	1110		3364
aac cgc tcc att gag gag agc ctg cag atc gcc tgg gcc ctc ctc tcc Asn Arg Ser Ile Glu Glu Ser Leu Gln Ile Ala Trp Ala Leu Leu Ser 1115	1120	1125		3412
atg ctg ccc cag ggc gag ctc aag cgc atc tcc aag gac cac atc ggc Met Leu Pro Gln Gly Glu Leu Lys Arg Ile Ser Lys Asp His Ile Gly 1130	1135	1140		3460
aag tac tac ggc cag aag ctg gag gag atc tgg ggc gcg ccc cag gcc Lys Tyr Tyr Gly Gln Lys Leu Glu Glu Ile Trp Gly Ala Pro Gln Ala 1145	1150	1155	1160	3508
ctg gac taaggagg tag atg agc cag gtg agc ccc acc cgg atg aac Leu Asp Met Ser Gln Val Ser Pro Thr Arg Met Asn 1165	1170			3557
ctt ctg cag agg cgg ggg cag ctc cgc ctg gcg cag aag ggg gtg gac Leu Leu Gln Arg Arg Gly Gln Leu Arg Leu Ala Gln Lys Gly Val Asp 1175	1180	1185		3605
ctc ctc aag aag aag cgg gac gcc ctg gtg gcc gag ttc ttc ggc ctg Leu Leu Lys Lys Lys Arg Asp Ala Leu Val Ala Glu Phe Phe Gly Leu 1190	1195	1200		3653
gtg cgg gag gcc atg gag gcc agg aag gcc ctg gac cag gcg gcc aag Val Arg Glu Ala Met Glu Ala Arg Lys Ala Leu Asp Gln Ala Ala Lys 1205	1210	1215	1220	3701
gag gcc tac gcc gcc ctc ctc ctg gcc cag gcc ttt gac ggg ccg gag Glu Ala Tyr Ala Ala Leu Leu Ala Gln Ala Phe Asp Gly Pro Glu 1225	1230	1235		3749
gtg gtg gcg ggg gcg gcc ctt ggg gtc ccg ccc ctc gag ggg gtg gag Val Val Ala Gly Ala Ala Leu Gly Val Pro Pro Leu Glu Gly Val Glu 1240	1245	1250		3797
gcg gag gtg gag aac gtc tgg ggg agc aag gtg ccg agg ctc aag gcc Ala Glu Val Glu Asn Val Trp Gly Ser Lys Val Pro Arg Leu Lys Ala 1255	1260	1265		3845
acc ttc ccc gac ggg gcc ctc ctt tcc ccg gtg ggg acc ccg gcc tac Thr Phe Pro Asp Gly Ala Leu Leu Ser Pro Val Gly Thr Pro Ala Tyr 1270	1275	1280		3893
acc ctc gag gcc agc cgg gcc ttc cgc cgc tac gcc gag gcc ctg atc Thr Leu Glu Ala Ser Arg Ala Phe Arg Arg Tyr Ala Glu Ala Leu Ile 1285	1290	1295	1300	3941
cggttg gcc aac acc gag acc cgc ctg aag aag atc ggg gag gag atc Arg Val Ala Asn Thr Glu Thr Arg Leu Lys Lys Ile Gly Glu Glu Ile 1305	1310	1315		3989
aag aag acc acg cgg cgg gtg aac gcc ctg gag cag gtg gtg atc ccg Page 6				4037

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Lys Lys Thr Thr Arg Arg Val Asn Ala Leu Glu Gln Val Val Ile Pro
1320 1325 1330

ggg atc cgc gcc cag atc cgc ttc atc cag cag gtc ctg gag cag cgg 4085
Gly Ile Arg Ala Gln Ile Arg Phe Ile Gln Gln Val Leu Glu Gln Arg
1335 1340 1345

gaa cgg gag gac acc ttc cgc ctc aag cgc atc aag ggc aag att gag 4133
Glu Arg Glu Asp Thr Phe Arg Leu Lys Arg Ile Lys Gly Lys Ile Glu
1350 1355 1360

gcc cgg gag gcc gag gag ggc ggc cgg ccc aac ccg cag gtg gag 4181
Ala Arg Glu Ala Glu Glu Gly Gly Arg Pro Asn Pro Gln Val Glu
1365 1370 1375 1380

atc ggg gcg ggc ctt taa 4199
Ile Gly Ala Gly Leu
1385

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<212> PRT

<213> Thermus thermophilus

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Val Arg Met Ala Val Ile Ala Asp Pro Glu Thr Ala Gln Gly Phe Arg
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Ser Leu Leu Glu Thr Leu Val Glu Arg Gly Gly Tyr Ala Leu Val Ala
35 40 45
Val Asp Glu Ala Leu Leu Pro Asp Pro Glu Arg Ala Val Glu Arg Leu
50 55 60
Met Arg Gly Arg Asp Leu Pro Val Leu Leu Pro Ile Ala Gly Leu Lys
65 70 75 80
Glu Ala Phe Gln Gly His Asp Val Glu Gly Tyr Met Arg Glu Leu Val
85 90 95
Arg Lys Thr Ile Gly Phe Asp Ile Lys Leu
100 105

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<212> PRT

<213> Thermus thermophilus

<400> 3

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20 25 30
Glu Gly Leu Val Gly Glu Ile Ile Arg Leu Asp Gly Asp Thr Ala Phe
35 40 45
Val Gln Val Tyr Glu Asp Thr Ser Gly Leu Lys Val Gly Glu Pro Val
50 55 60
Val Ser Thr Gly Leu Pro Leu Ala Val Glu Leu Gly Pro Gly Met Leu
65 70 75 80
Asn Gly Ile Tyr Asp Gly Ile Gln Arg Pro Leu Glu Arg Ile Arg Glu
85 90 95
Lys Thr Gly Ile Tyr Ile Thr Arg Gly Val Val Val His Ala Leu Asp
100 105 110
Arg Glu Lys Lys Trp Ala Trp Thr Pro Met Val Lys Pro Gly Asp Glu

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Val Arg Gly Gly Met Val Leu Gly Thr Val Pro Glu Phe Gly Phe Thr
 115 120 125
 130 135 140
 His Lys Ile Leu Val Pro Pro Asp Val Arg Gly Arg Val Lys Glu Val
 145 150 155 160
 Lys Pro Ala Gly Glu Tyr Thr Val Glu Glu Pro Val Val Val Leu Glu
 165 170 175
 Asp Gly Thr Glu Leu Lys Met Tyr His Thr Trp Pro Val Arg Arg Ala
 180 185 190
 Arg Pro Val Gln Arg Lys Leu Asp Pro Asn Thr Pro Phe Leu Thr Gly
 195 200 205
 Met Arg Ile Leu Asp Val Leu Phe Pro Val Ala Met Gly Gly Thr Ala
 210 215 220
 Ala Ile Pro Gly Pro Phe Gly Ser Gly Lys Thr Val Thr Gln Gln Ser
 225 230 235 240
 Leu Ala Lys Trp Ser Asn Ala Asp Val Val Val Tyr Val Gly Cys Gly
 245 250 255
 Glu Arg Gly Asn Glu Met Thr Asp Val Leu Val Glu Phe Pro Glu Leu
 260 265 270
 Thr Asp Pro Lys Thr Gly Gly Pro Leu Met His Arg Thr Val Leu Ile
 275 280 285
 Ala Asn Thr Ser Asn Met Pro Val Ala Ala Arg Glu Ala Ser Ile Tyr
 290 295 300
 Val Gly Val Thr Ile Ala Glu Tyr Phe Arg Asp Gln Gly Phe Ser Val
 305 310 315 320
 Ala Leu Met Ala Asp Ser Thr Ser Arg Trp Ala Glu Ala Leu Arg Glu
 325 330 335
 Ile Ser Ser Arg Leu Glu Glu Met Pro Ala Glu Glu Gly Tyr Pro Pro
 340 345 350
 Tyr Leu Ala Ala Arg Leu Ala Ala Phe Tyr Glu Arg Ala Gly Lys Val
 355 360 365
 Ile Thr Leu Gly Gly Glu Gly Ala Val Thr Ile Val Gly Ala Val
 370 375 380
 Ser Pro Pro Gly Gly Asp Met Ser Glu Pro Val Thr Gln Ser Thr Leu
 385 390 395 400
 Arg Ile Val Gly Ala Phe Trp Arg Leu Asp Ala Ser Leu Ala Phe Arg
 405 410 415
 Arg His Phe Pro Ala Ile Asn Trp Asn Gly Ser Tyr Ser Leu Phe Thr
 420 425 430
 Ser Ala Leu Asp Pro Trp Tyr Arg Glu Asn Val Ala Glu Asp Tyr Pro
 435 440 445
 Glu Leu Arg Asp Ala Ile Ser Glu Leu Leu Gln Arg Glu Ala Gly Leu
 450 455 460
 Gln Glu Ile Val Gln Leu Val Gly Pro Asp Ala Leu Gln Asp Ala Glu
 465 470 475 480
 Arg Leu Val Ile Glu Val Gly Arg Ile Ile Arg Glu Asp Phe Leu Gln
 485 490 495
 Gln Asn Ala Tyr His Glu Val Asp Ala Tyr Cys Ser Met Lys Lys Ala
 500 505 510
 Tyr Gly Ile Met Lys Met Ile Leu Ala Phe Tyr Lys Glu Ala Glu Ala
 515 520 525
 Ala Ile Lys Arg Gly Val Ser Ile Asp Glu Ile Leu Gln Leu Pro Val
 530 535 540
 Leu Glu Arg Ile Gly Arg Ala Arg Tyr Val Ser Glu Glu Glu Phe Pro
 545 550 555 560
 Ala Tyr Phe Glu Glu Ala Met Lys Glu Ile Gln Gly Ala Phe Lys Ala
 565 570 575
 Leu Ala

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<213> Thermus thermophilus

<400> 4

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Pro Leu Leu Phe Val Glu Asn Ala Lys Asp Leu Ala Tyr Gly Ala Ile
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Val Asp Ile Lys Asp Gly Thr Gly Arg Val Arg Gly Gly Gln Val Ile
35 40 45
Glu Val Ser Glu Glu Tyr Ala Val Ile Gln Val Phe Glu Glu Thr Thr
50 55 60
Gly Leu Asp Leu Ala Thr Thr Ser Val Ser Leu Val Glu Asp Val Ala
65 70 75 80
Arg Leu Gly Val Ser Lys Glu Met Leu Gly Arg Arg Phe Asn Gly Ile
85 90 95
Gly Lys Pro Ile Asp Gly Leu Pro Pro Ile Thr Pro Glu Lys Arg Leu
100 105 110
Pro Ile Thr Gly Leu Pro Leu Asn Pro Val Ala Arg Arg Lys Pro Glu
115 120 125
Gln Phe Ile Gln Thr Gly Ile Ser Thr Ile Asp Val Met Asn Thr Leu
130 135 140
Val Arg Gly Gln Lys Leu Pro Ile Phe Ser Gly Ser Gly Leu Pro Ala
145 150 155 160
Asn Glu Ile Ala Ala Gln Ile Ala Arg Gln Ala Thr Val Arg Pro Asp
165 170 175
Leu Ser Gly Gly Glu Lys Glu Glu Pro Phe Ala val Val Phe Ala
180 185 190
Ala Met Gly Ile Thr Gln Arg Glu Leu Ser Tyr Phe Ile Gln Glu Phe
195 200 205
Glu Arg Thr Gly Ala Leu Ser Arg Ser Val Leu Phe Leu Asn Lys Ala
210 215 220
Asp Asp Pro Thr Ile Glu Arg Ile Leu Thr Pro Arg Met Ala Leu Thr
225 230 235 240
Val Ala Glu Tyr Leu Ala Phe Glu His Asp Tyr His Val Leu Val Ile
245 250 255
Leu Thr Asp Met Thr Asn Tyr Cys Glu Ala Leu Arg Glu Ile Gly Ala
260 265 270
Ala Arg Glu Ile Pro Gly Arg Arg Gly Tyr Pro Gly Tyr Met Tyr
275 280 285
Thr Asp Leu Ala Thr Ile Tyr Glu Arg Ala Gly Val Val Glu Gly Lys
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Arg Thr His Pro Ile Pro Asp Leu Thr Gly Tyr Ile Thr Glu Gly Gln
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Ile Gln Leu Ser Arg Glu Leu His Arg Lys Gly Ile Tyr Pro Pro Ile
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Gly Lys Thr Arg Glu Asp His Lys Gln Val Ser Asp Gln Leu Tyr Ser
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Ala Arg Lys Ala Leu Asp Gln Ala Ala Lys Glu Ala Tyr Ala Ala Leu
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Leu Leu Ala Gln Ala Phe Asp Gly Pro Glu Val Val Ala Gly Ala Ala
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Trp Gly Ser Lys Val Pro Arg Leu Lys Ala Thr Phe Pro Asp Gly Ala
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Ala Phe Arg Arg Tyr Ala Glu Ala Leu Ile Arg Val Ala Asn Thr Glu
130 135 140
Thr Arg Leu Lys Lys Ile Gly Glu Glu Ile Lys Lys Thr Thr Arg Arg
145 150 155 160
Val Asn Ala Leu Glu Gln Val Val Ile Pro Gly Ile Arg Ala Gln Ile
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Arg Phe Ile Gln Gln Val Leu Glu Gln Arg Glu Arg Glu Asp Thr Phe
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Arg Leu Lys Arg Ile Lys Gly Lys Ile Glu Ala Arg Glu Ala Glu Glu
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Glu Gly Gly Arg Pro Asn Pro Gln Val Glu Ile Gly Ala Gly Leu
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